



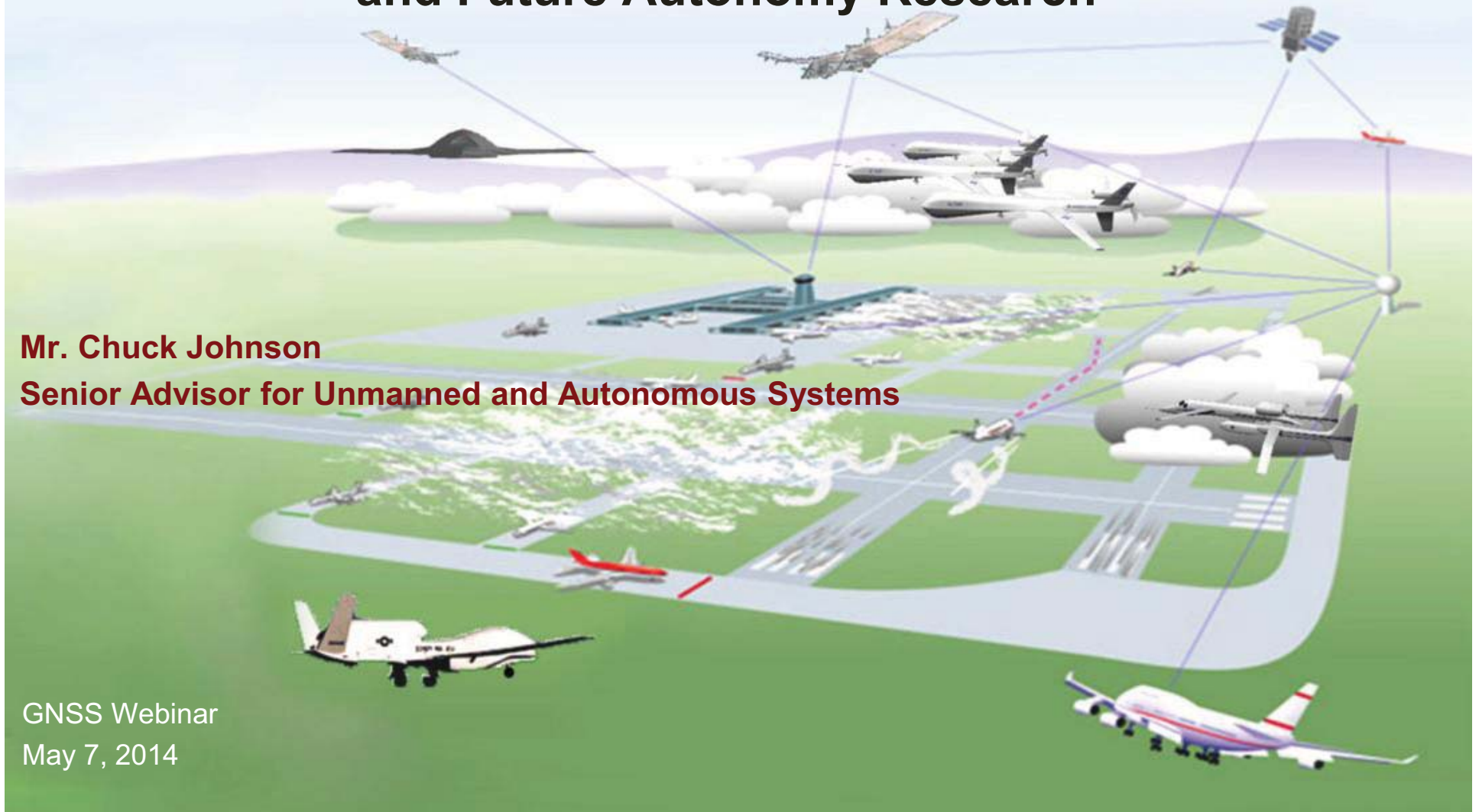
National Aeronautics and Space Administration



UAS Integration in the NAS Project and Future Autonomy Research

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GNSS Webinar
May 7, 2014

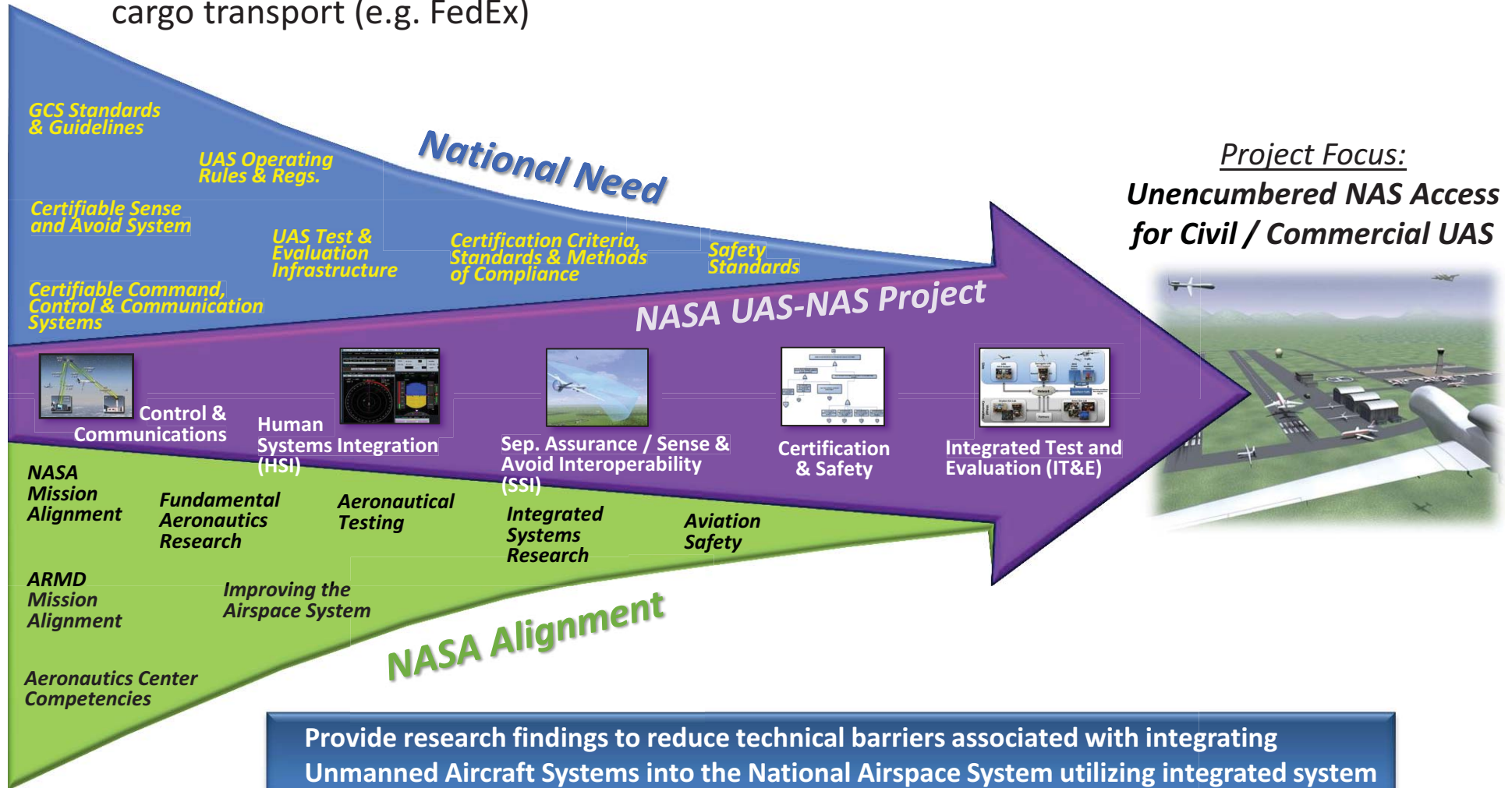




Developing the UAS-NAS Project



There is an increasing need to fly UAS in the NAS to perform missions of vital importance to National Security and Defense, Emergency Management, and Science. There is also an emerging need to enable commercial applications such as cargo transport (e.g. FedEx)



Provide research findings to reduce technical barriers associated with integrating Unmanned Aircraft Systems into the National Airspace System utilizing integrated system level tests in a relevant environment.



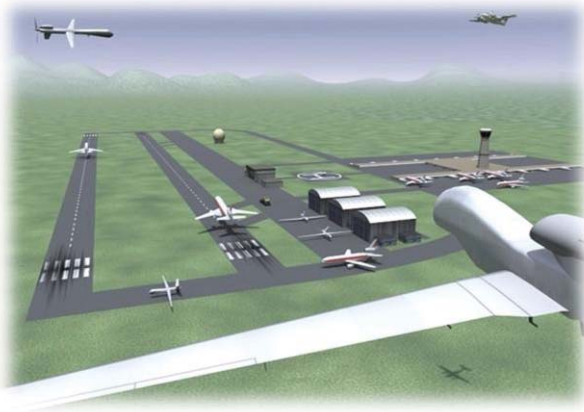
UAS-NAS Project Formulation

Key Stakeholders and Influencing Factors

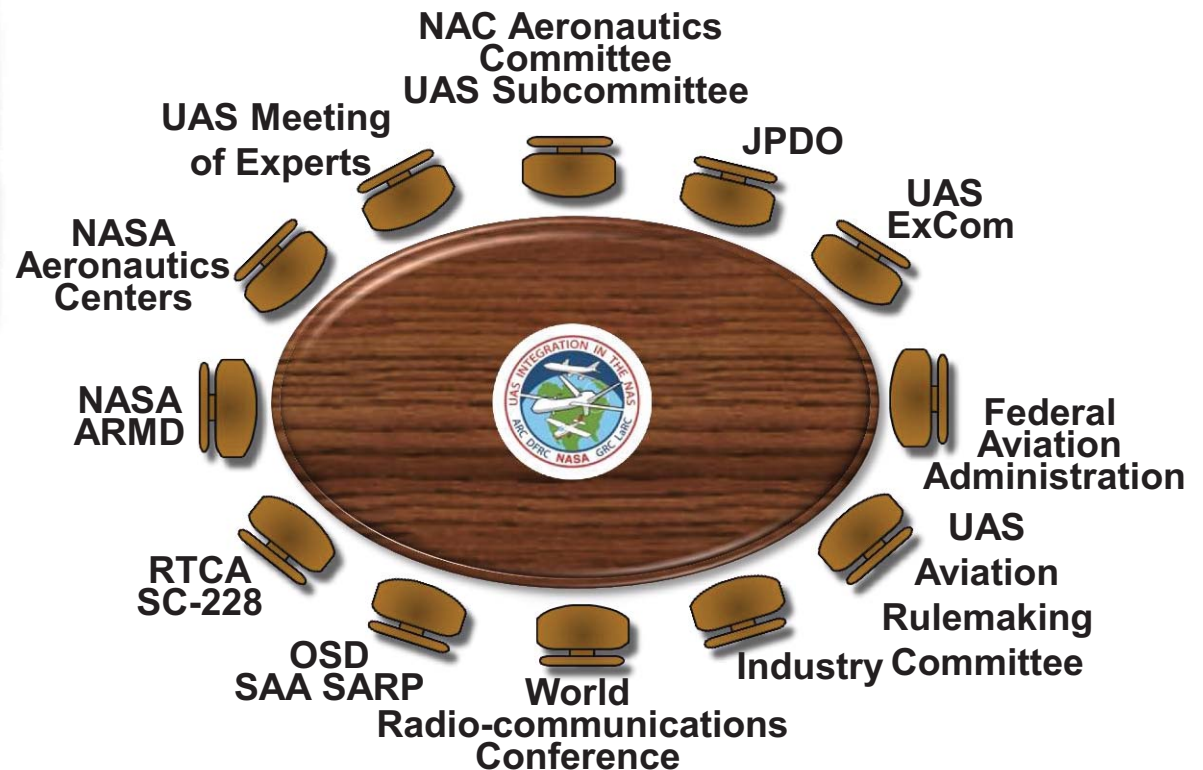


Project Focus:

*Unencumbered NAS Access for Civil
/ Commercial UAS*



Groups Working on the Problem



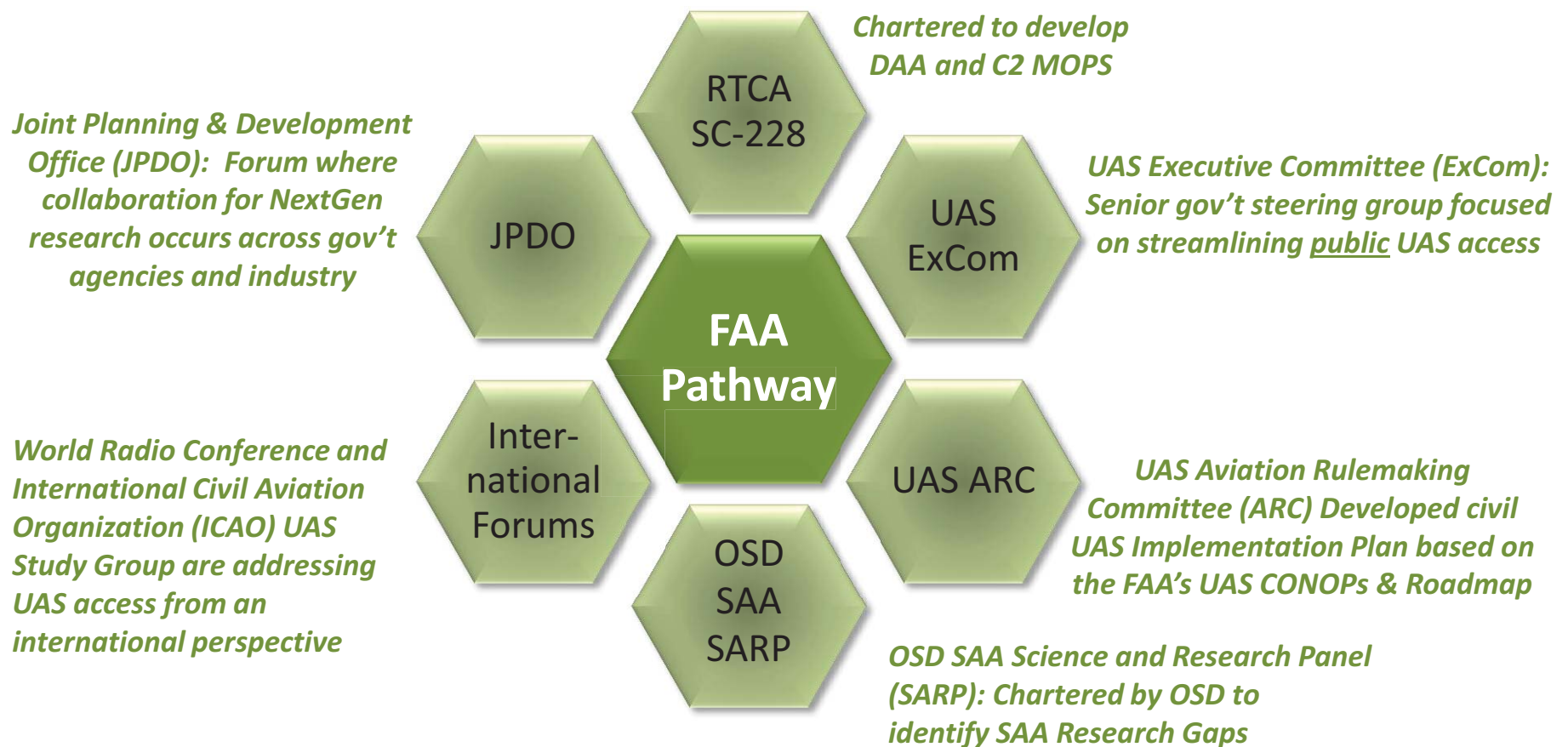
The NASA UAS-NAS Project is influenced by several key stakeholders within the UAS Community which helped guide it's formulation



FAA Pathway to UAS Access



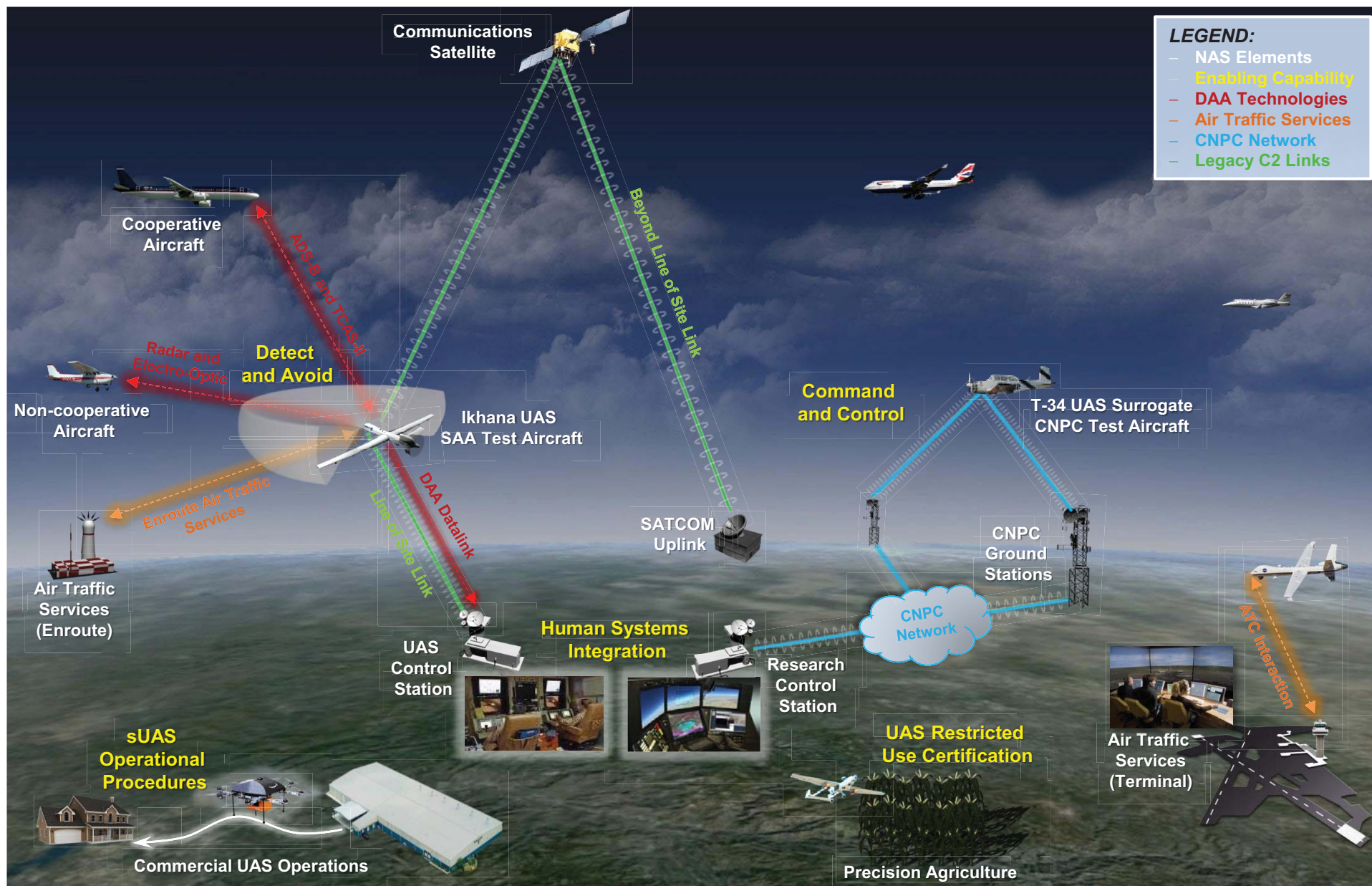
- The FAA is using several domestic forums, in conjunction with several international forums to lay out the pathway for their priorities and investments.
 - If work is conducted outside of the pathway, the FAA may be unwilling to collaborate



NASA has a leadership role within each of these forums



UAS-NAS Project OV-1





UAS-NAS Technical Challenges



SAA Performance Standards

TC-SAA

- Provide research findings to develop and validate UAS Minimum Operational Performance Standards (MOPS) for sense and avoid (SAA) performance and interoperability.

C2 Performance Standards

TC-C2

- Provide research findings to develop and validate UAS Minimum Operational Performance Standards (MOPS) for terrestrial command and control (C2) communication.

Human Systems Integration

TC-HSI

- Provide research findings to develop and validate human systems integration (HSI) ground control station (GCS) guidelines enabling implementation of the SAA and C2 performance standards.

Integrated Test and Evaluation

TC-ITE

- Develop a relevant test environment for use in generating research findings to develop and validate HSI Guidelines, SAA and C2 MOPS with test scenarios supporting integration of UAS into the NAS.



NASA'S Vision for Civil Aviation

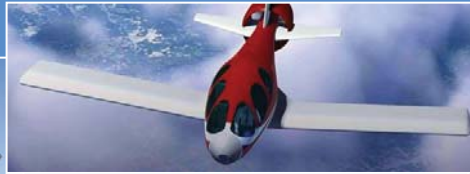


Where does autonomy fit?

TRANSFORMATIVE



On Demand



Fast

Transforming Aviation

Autonomy enabling a new overall aviation system with vastly greater capabilities such as on-demand transportation

SUSTAINABLE



Intelligent



Low Carbon

Enabling New Capabilities

Autonomy enabling re-designed or completely new components of the system to improve safety, efficiency and mobility

GLOBAL

Safety, NextGen
Efficiency, Environment

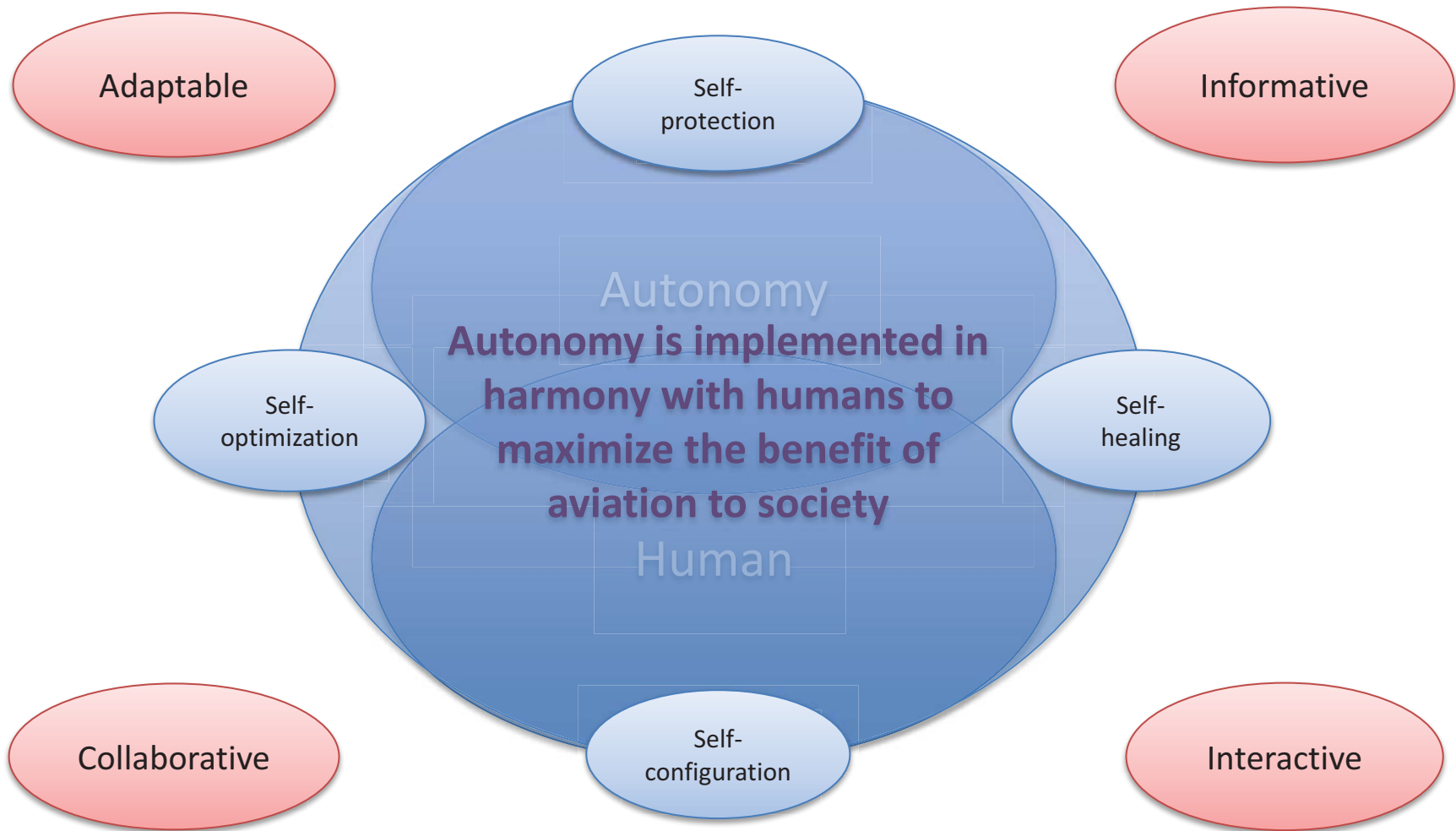


Infusing Functionality

Autonomy infused into targeted components of the current system for improvements to safety and efficiency, and to expand the constraints and boundaries of the system



NASA's Vision for Autonomy in Civil Aviation





Autonomy Strategy Framework



Vision

Autonomy is implemented in harmony with humans to maximize the benefit of aviation to society

Needs

Technologies & Applications

Develop archetypal / model autonomy standards, technologies, functions and mission applications to broadly enable innovation

Trusted Systems Integration

Address the challenges associated with trust between humans and autonomous systems

Architectures, Methods & Metrics

Develop architectures and meta-design tools that enable the efficient and effective creation of joint human-machine cognitive systems

Real World Testbeds

Establish relevant testbeds for testing autonomous systems

Challenges

Technical (Research to Enable)

Issues such as human-machine collaboration, TEV&V, machine reasoning, sensor integration, etc.

Socio-Policy (Research to Inform)

Issues such as liability, public acceptance, moral decision-making, transformation of human roles/tasks, etc.